Sergey Nikolayevich Vernov (On His 50th Birthday)

S/053/60/072/001/005/005
B013/B060

interaction of cosmic rays with matter and obtained an insight into the mechanism of the formation of secondary cosmic rays in the atmosphere. It became thus possible to describe this process quantitatively. On Vernov's initiative, elementary processes of the interaction of 10^{11} - 10^{13} ev particles with atomic nuclei are being studied from a stratoplane. Under his supervision, a first-class laboratory was established at Moskovskiy gosudarstvennyy universitet (Moscow State University) to serve for research work on interaction of ultrahigh-energy particles (10^{14} - 10^{16} ev) with matter. The USSR network of stations for the permanent recording of cosmic rays was established with his participation, and is now operating under the IGY program. In acknowledgment of his scientific achievements, Vernov was elected Corresponding Member of the Akademiya nauk SSSR (Academy of Sciences USSR) in 1953. He was awarded the Lenin Prize in 1960 for his discovery and research of the outer radiation belt of the earth. S. N. Vernov is the head of the NIIYaF MGU (Scientific Research Institute of Nuclear Physics of Moscow State University), and runs the special section of the fizicheskiy fakul'tet MGU (Department of Physics at the MGU). There are 1 figure and 37 Soviet references.

Card 3/3

ZATSEPIN, G.T., DEDENKO, L.G., GORYUNOV, N.N.,

"Development of Air Showers and Nature of Primary Component at High Energies,"

report presented at the Intl. Conference on Cosmic Rays and Earth Storms, Kyoto, Japan, 4-15 Sept 1961.

ZATSEPIN, G.T., CHUDAKOV, A.YE., NESTEROVA, N.M., DADYKIN, V.L.,

"A Search for Photons with the Energy of 10^{13} ev. From Discrete Sources of Cosmic Radiation,"

report presented at the Intl. Conference on Cosmic Rays and Earth Storms, Kyoto, Japan, 4-15 Sept 1961.

ZATSEPIN, G.T., MIKHALCHI, YE, D.,

"Energy and Angular Distribution of M-Mesons at Great Depths Underground,"

report presented at the Intl. Conference on Cosmic Rays and Earth Storms, Kyoto, Japan, 4-15 Sept 1961.

ZATSEPIN, G.T., KUZMIN, V.A.,

"Neutrinos in Cosmic Rays and Possible Types of Related Experiments,"

report presented at the Intl. Conference on Cosmic Rays and Earth Storms, Kyoto, Japan, 4-15 Sept 1961.

S/056/61/041/002/027/028
B125/B138

3,2410

AUTHORS: Zatsepin, G. T., Chudakov, A. Ye.

TITLE: Methods of seeking local sources of high-energy protons

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 41, no. 2, 1961, 655-656

TEXT: The method proposed by Cocconi for the localization of protons with $E \sim 10^{12}$ ev on the celestial sphere is based on the measurement of the relative delay times of the passage of a front of an atmospheric shower through scintillators. The authors believe that showers caused by 10^{12}-ev protons in the solid angle $\Omega \sim 10^{-3}$ sterad can be recorded more reliably and considerably more simply by using the Cherenkov radiation produced by a shower in the atmosphere. In doing so, the light flash is recorded by a photomultiplier placed in the focal point of a big parabolic mirror. In order to separate the showers according to the pulse coincidences, it is advisable to use several paraboloids in parallel arrangement. A primary photon of 10^{12} ev yields a flux of ~ 50 quanta/m^2. To record such showers the parabolic mirror should have an area of ~ 4 m^2. In the authors' view,

S/056/61/041/002/027/028
B125/B138

Methods of seeking local sources ...

the method described here is better suited for the detection of photons coming from known radioastronomical objects than the Cocconi method. When the measuring apparatus is mounted on a mountain and larger mirrors are used, even primary photons of less than 10^{12} ev, can be recorded. Another advantage of the authors' method is the relatively large effective area of shower recording (of an order of 10^5 m^2), which ensures high statistical accuracy. Using experimental data on cosmic rays in the atmosphere, the intensity of a photon flux with an energy greater than E at a distance R from the object is estimated to be

$I_{\Phi}(>E) \sim 10^{-5} E_{min}^{\gamma-1} E^{-\gamma} c R^{-2} \varepsilon_{cos} M$, where E_{min} ($\sim 10^{-3}$ erg) is the minimum energy of cosmic-ray particles in the object; c is the speed of light; ε_{cos} and M are the density of cosmic-ray energy and the mass of gas in the object respectively. This formula is valid if the energy spectrum of cosmic rays in radio nebulae has the same shape as in the neighborhood of the earth. The expected portion of showers originating from photons within the solid angle $\Omega = 10^{-3}$ is given by

$\Delta = (I_{\Phi}/I_{cos}) \cdot 10^3 = 5 \cdot 10^{10} \varepsilon_{cos} MR^{-2} \approx 2 \cdot 10^9 \overline{H^2} MR^{-2}$. This formula is valid on

Card 2/3

S/056/61/041/002/027/028
B125/B138

Methods of seeking local sources ...

the condition that $\bar{\varepsilon}_{cos} = \overline{H^2}/8\pi$, where H indicates the magnetic-field strength. In the case of the crab nebula, the following relation results from $H = 3 \cdot 10^{-3}$ oe, $M = 10^{33}$ g, and $R = 10^{22}$ cm: $\Delta = 2 \cdot 10^{-7}$. For the center of the Galaxy, $\Delta = 5 \cdot 10^{-4}$ follows from $H = 10^{-3}$, $M = 10^{38}$, and $R = 2 \cdot 10^{22}$. It is seen that even the most favorable estimates yield only very small values of photon intensity. Since the spectrum of cosmic rays in several objects shows more high-energy particles than in the neighborhood of the earth, and since most astrophysical quantities are accurate only up to one order of magnitude, it would be useful to study the most promising objects (center of the Galaxy, radio nebulae) by the method discussed here. There are 3 Soviet references.

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva Akademii nauk SSSR (Physics Institute imeni P. N. Lebedev of the Academy of Sciences USSR)

SUBMITTED: June 6, 1960

Card 3/3

31778
S/056/61/041/006/024/054
B102/B138

24.6610

AUTHORS: Zatsepin, G. T., Kuz'min, V. A.

TITLE: Generation of a neutrino in the atmosphere

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 41, no. 6(12), 1961, 1818-1827

TEXT: Calculations are given for the energy and angular distributions of neutrinos produced in the atmosphere in the decays $\pi \to \mu + \nu$ and $\mu \to e + \nu + \nu$. The neutrino spectra were calculated with allowance for muon energy losses and angular distributions of neutrino fluxes in the atmosphere. Assuming that all secondary particles have the same direction of flight as the primary ones, the problem may be regarded as one-dimensional. In this approximation the neutrino spectrum from muon decay at a depth x in the atmosphere and at an angle θ to the vertical is given by

Card 1/7

Generation of a neutrino in the ...

$$P_\pi^\nu(x, \varepsilon, \theta) = (1 - e^{-x})\, F^\nu(\varepsilon, \theta) \approx \frac{I_\pi A_{\pi\nu}\, \varepsilon^{-(\gamma+1)}}{1 + 3{,}28\,\varepsilon/E_\pi(\theta)}\,(1 - e^{-x}), \qquad (3)$$

$$F^\nu(\varepsilon, 0) = \frac{I_\pi^{\cdot\cdot}}{1 - m^2/M^2} \int_{\varepsilon(1-m^2/M^2)^{-1}}^{\infty} \frac{E^{-(\gamma+2)}\, dE}{1 + E/E_\pi(\theta)}, \qquad A_{\pi\nu} = \frac{1}{1+\gamma}\left(1 - \frac{m^2}{M^2}\right)^\gamma,$$

ε being neutrino energy, m and M are muon and pion mass, resp., I_π is the intensity of pion generation at E=1 (energies are given in Bev), γ - the exponent of the integral spectrum of pion generation, $E_\pi(\theta)$ - critical pion energy at which the pion decay probability at x=1 equals the probability of nuclear interaction. At sea level and vertical flux,

$$P_\pi^\nu(\varepsilon, 0)\, d\varepsilon = \begin{cases} 1{,}85 \cdot 10^{-4}\,(0{,}08 + \varepsilon)^{-2{,}69}\, d\varepsilon, & 1 < \varepsilon < 10 \\ 6{,}65 \cdot 10^{-3}\,(1{,}1 + \varepsilon)^{-3{,}22}\, d\varepsilon, & 10 < \varepsilon < 300 \end{cases} \qquad (4).$$

The total flux of neutrinos with more than 1 Bev was found to be $8.9 \cdot 10^{-3}$ $cm^{-2} sec^{-1} steradian^{-1}$. This is more than double the value found by I. M. Zhelenykh and M. A. Markov (Preprint OIYaI, 1960; Nucl. Phys., Card 2/7

Generation of a neutrino in the ...

printing). For neutrinos produced in muon decay

$$P_{\mu}^{\nu}(x, \varepsilon, \theta) = \int_{\varepsilon}^{\infty} P_{d}^{\mu}(x, E, \theta) R_{\mu\nu}(E, \varepsilon) dE, \qquad (7)$$

$$P_{d}^{\mu}(x, E, \theta) = \int_{0}^{x} [l_{\mu}(E) \rho(t, \theta)]^{-1} P^{\mu}(t, E, \theta) dt \qquad (8)$$

is found. The total muon spectrum for $E \gtrsim 10^{11}$ ev is given by

$$P^{\mu}(x, E, \theta) = \qquad (9)$$

$$= I_{\pi} A_{\pi\mu} E^{-(\gamma+1)} \int_{0}^{x} e^{\mu - t} \left[1 + \frac{\beta}{lE}(x-t)\right]^{-(\gamma+1)} \left\{1 + \frac{1{,}22E}{E_{\pi}(\theta)}\left[1 + \frac{\beta}{E}(x-t)\right]\right\}^{-1} dt,$$

with

Card 3/7

Generation of a neutrino in the ...

$$A_{\pi\mu} = \frac{1-(m/M)^{2(\gamma+1)}}{(1+\gamma)(1-m^2/M^2)}, \qquad (9a),$$

$$u = \frac{mc}{\tau_{0\mu}} \int_x^t \frac{dz}{\rho(z,\theta)[R+\beta(x-z)]},$$

β denotes muon energy losses to ionization, per unit of path length. The spectrum of the muon decay neutrinos is

$$P_\mu^\nu(\varepsilon, 0)\,d\varepsilon = \begin{cases} 7{,}65\cdot10^{-3}(0{,}37+\varepsilon)^{-3{,}78}\,d\varepsilon, & 1<\varepsilon<10 \\ 1{,}48\,(3{,}5+\varepsilon)^{-4{,}51}\,d\varepsilon, & 10<\varepsilon<100 \end{cases} \qquad (11),$$

the value for energies >1 Bev is $P_\mu^\nu(>1.0) = 1.17\cdot10^{-2}$ cm^{-2}sec^{-1}steradian^{-1}, the total neutrino spectrum is

$$P^\nu(\varepsilon, 0)\,d\varepsilon = \begin{cases} 0{,}0\cdot10^{-3}(0{,}15+\varepsilon)^{-3{,}18}\,d\varepsilon, & 1<\varepsilon<10 \\ 0{,}12\,(0{,}9+\varepsilon)^{-3{,}64}\,d\varepsilon, & 10<\varepsilon<300. \end{cases} \qquad (12)$$

Card 4/7

Generation of a neutrino in the ...

and $P^{\nu}(>1.0) = 2.06 \cdot 10^{-2}$ cm^{-2}sec^{-1}steradian^{-1}. Allowance for polarization increases, the intensity of muon decay neutrinos by ~5%. Muon energy losses have only a weak effect on neutrino production. The spectra were normalized using earlier experimental values.

For $I_{\pi} = 0.159$ cm^{-2}sec^{-1}steradian^{-1}Bev^{-1} and $\gamma = 1.62$ the calculated muon spectrum agreed with experimental values in the energy range 10^{9}-10^{12} ev. The neutrino fluxes in the atmosphere are anisotropically distributed; anisotropy, $P^{\nu}(\varepsilon,\pi/2)/P^{\nu}(\varepsilon,0)$, increases with neutrino energy. It tends to 10 for pion decay and to 10L $(x,x_{eff},\pi/2)/L(x,x_{eff},0)$ for muon decay at $\varepsilon \gg 10^{12}$ ev. The inaccuracies in the results are due to the ambiguity of the K-meson contribution to neutrino flux, although it is higher than that of pions. The total vertical neutrino flux with >1 Bev is five times as high as estimated by Zhelezin and Markov, who only considered pion decay. An experimental arrangement (Fig. 5) is proposed for recording high-energy cosmic neutrinos. It consists of three mosaic layers of scintillation counters (1,2,3) which record the muon path. The absorbers (a) are used

Card 5/7

Generation of a neutrino in the ...

for determination of the threshold energy. Yu. S. Kopysov and V. A. Kuz'min are mentioned. There are 5 figures and 15 references: 9 Soviet and 6 non-Soviet. The four most recent references to English-language publications read as follows: F. Ashton et al., Nature, 185, 364, 1960; J. Duthie et al., Preprint, 1961; Y. Yamaguchi. Prog. Theor. Phys., 23, 1117, 1960; M. A. Markov, I. M. Zheleznykh. Nucl. Phys., in print.

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva Akademii nauk SSSR (Physics Institute imeni P. N. Lebedev of the Academy of Sciences, USSR)

SUBMITTED: March 8, 1961

Card 6/7

31778
S/056/61/041/006/024/054
B102/B138

Generation of a neutrino in the ...

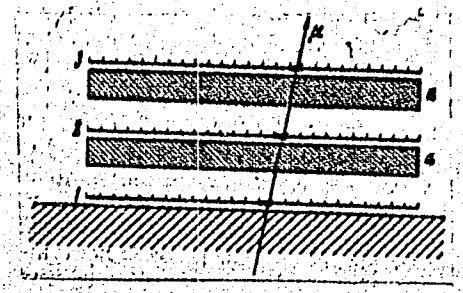


FIG. 5

Card 7/7

24 6700

37552
S/048/62/026/005/018/022
B108/B102

AUTHOR: Zatsepin, G. T.

TITLE: Fundamental characteristics of high-energy nucleon collisions

PERIODICAL: Akademiya nauk SSSR. Izvestiya. Seriya fizicheskaya, v. 26, no. 5, 1962, 674-681

TEXT: A review is given of nucleon-nucleon processes considered kinematically with empirical models. Results: High-energy nucleon-nucleon collisions are usually peripheral ($E_0 > 3 \cdot 10^{10}$ ev) and proceed on the basis of π-π collisions. The excited meson cloud is characterized by the equation of state $p/\varepsilon \leq 1/3$ (p - pressure, ε - energy density) of the substance concerned, and disintegrates isotropically to produce low-energy pions of about 0.5 Bev. The nucleons have a "mellow" field of strongly interacting pions which form clusters of excited mesonic substance. There are 3 figures. The most important English-language reference is: Peters B., Proc. cosm. ray conf. Kyoto. Japan. Suppl. to v. 17 of J. Phys. Soc. Japan.

Card 1/1

Nature of the primary component of ... S/048/62/026/005/020/022
B108/B102

a great number of particles vary less than do those of showers involving fewer particles. The decrease in fluctuations observed at a higher exponent in the spectral law indicates that heavy nuclei are the predominant primary component at high energies. There are 2 figures.

Card 2/2

S/040/62/026/006/009/020
B125/B102

AUTHORS: Zheleznykh, I. M., Zatsepin, G. T., Kuz'min, V. A., and Markov, M. A.

TITLE: Neutrino physics of high energies in cosmic rays

PERIODICAL: Akademiya nauk SSSR. Izvestiya. Seriya fizicheskaya, v. 26, no. 6, 1962, 738-741

TEXT: Some possibilities of neutrino physics in cosmic radiation are evaluated. The energy spectrum and angular distribution of the products (e.g. muons) of cosmic neutrino reactions with matter can be calculated accurately. The low intensity of the neutrino flux necessitates using large-area measuring equipment, e.g. several series of scintillators. Muons may result from the reaction

$$\begin{aligned}
&(a)\ \nu + n \to p + \mu^-(e^-),\\
&(b)\ \bar{\nu} + p \to n + \mu^+(e^+),\\
&(c)\ \bar{\nu} + n \to \Sigma^- + \mu^+(e^+),\\
&(d)\ \bar{\nu} + p \to \Sigma^0 + \mu^+(e^+),\\
&(e)\ \bar{\nu} + p \to \Lambda^0 + \mu^+(e^+).
\end{aligned} \qquad (1).$$

Card 1/3

In the case of point interaction, the reaction (1a) has the cross section $\sigma_\nu \approx 1.5 \cdot 10^{-38} E_\nu \text{ cm}^2$ and $\sigma_\nu \approx 0.5 \cdot 10^{-38} E_\nu \text{cm}^2$ (E in Bev) holds for (1,b,c,d,e). When the energies increase to above the Bev range, the cross sections are modified by a form factor. The four-fermion interaction involving baryons and also total interaction can be cut off by the Hofstadter form factor. In this case, weak interactions could supply information as to the usual electromagnetic form factors of the nucleon. If, using the laboratory system, the cross section of the $\nu + N \to N' + \mu$-type reaction is not cut off up to neutrino energies of $E_\nu = 300$ Bev, an apparatus with an active area of 300 m^2 is capable of recording annually 70, 50 and 30 muons at thresholds of 0.5, 1 and 3 Bev, respectively. In the case of cutting off with the Hofstadter form factor, 12, 9 and 3.5 events are recorded annually at thresholds of 0.5, 1 and 3 Bev, respectively. In connection with the possible existence of an intermediate boson, reactions of the type

$$\nu + Z \to W + \mu + Z', \quad \bar{\nu} + Z \to W + \mu + Z', \qquad (4),$$

$$\bar{\nu} + e^- \to W \to \mu^- + \bar{\nu}, \qquad (5),$$

$$\nu + n \rightarrow W' \rightarrow p + \mu$$
$$\bar{\nu} + p \rightarrow W' \rightarrow n + \mu, \quad (6)$$

are of interest. When the neutrinos ν_μ and ν_e are of different natures, the reaction (5) can be due only to ν_e neutrinos from muon decay. The result obtained by J. C. Barton (Phys. Rev. Lettrs. 5, 514, 1960) furnishes no proof for the absence of an intermediate boson with the mass of the K-particle. In the first stage of a subterranean experiment the muons produced during the reactions (1) will be recorded, as electrons are much more difficult to record. There are 3 figures.

Card 3/3

. . . KALITKIN, L. V. KUZMINA, G. T. ZATSEPIN

Calculation of muon penetration through substances taking into account fluctuation losses

Report submitted for the 8th Intl. Conf. on Cosmic Rays (IUPAP), Jaipur, India, 2-14 Dec 1963

ZATSEPIN, G.T., doktor fiz.-matem.nauk; KUZ'MIN, V.A.

Some problems in neutrino physics. Vest. AN SSSR 34 no. 2: 50-55 F '64. (MIRA 17:5)

L 4468-66 EWT(m)/T/EWA(m)-2

ACC NR: AP5024648 SOURCE CODE: UR/0048/65/029/009/1740/1742

AUTHOR: Volkova L.V.; Zatsepin, G.T.

ORG: none

TITLE: Energy spectra of muonic and electronic neutrinos in the atmosphere /Report, All-Union Conference on Cosmic Ray Physics held at Apatity 24-31 August 1964/

SOURCE: AN SSSR. Izvestiya. Seriya fizicheskaya, v. 29, no. 9, 1965, 1740-1742

TOPIC TAGS: secondary cosmic ray, neutrino, spectral energy distribution, angular distribution

ABSTRACT: The energy spectra and angular distributions of electronic and muonic neutrinos and antineutrinos in the atmosphere were calculated and the results are given graphically and in tabular form. For the calculations it was assumed that the muonic neutrinos arise from $\pi_{\mu 2}$, $K_{\mu 2}$ and μe decay, the electronic neutrinos arise [illegible] mesons as negative pions, and that the production of K_0 and $\bar{K}_0$ mesons is analogous to that of K^+ and K^- mesons. Differences between the neutrino spectra presented here and those calculated by R.Cowsik, Yash Pal, T.N.Rengarajan, and S.N.Tandon (International Conference on Cosmic Rays, Jaipur, 1963) are due to differences between the assump

Card 1/2

L 4468-66

ACC NR: AP5024648

tions underlying the two calculations. Orig. art. has: 1 formula, 5 figures, and 1 table.

SUB CODE: MP/ SUBM DATE: 00/ ORIG REF: 001/ OTH REF: 001

Card 2/2

L 4488-66 EWT(1)/FCC/EWA(h) CW

ACC NR: AP5024656 SOURCE CODE: UR/0048/65/029/009/1765/1768

AUTHOR: Volkova, L.V.; Zatsepin, G.T.

ORG: none

TITLE: Muon production in the atmosphere and the energy dependence of the positive excess. All-Union Conference on Cosmic Ray Physics held at Apatity 24-31 August 1964

SOURCE: AN SSSR. Izvestiya. Seriya fizicheskaya, v. 29, no. 9, 1965, 1765-1768

TOPIC TAGS: secondary cosmic ray, muon, pion, particle production, primary cosmic ra

ABSTRACT: The muon positive excess and its energy dependence are very sensitive to the meson production mechanism. These quantities have therefore been calculated on

Card 1/2

ACC NR. AP5024656

... of negative to the number of positive pions produced by neutrons (this ... the positive excess ... is many ...

...ures

SUB CODE: NP/ SUBM DATE: 00/ ORIG REF: 003/ OTH REF: 002

Card 2/2

ZATSEPIN, G.T.; NIKISHOV, A.I.

Role of the photonuclear mechanism in the generation of asymmetrical streams. Izv. AN SSSR. Ser. fiz. 28 no.11: 1824-1825 N '64. (MIRA 17:12)

1. Fizicheskiy institut im. P.N. Lebedeva AN SSSR.

ZATSEPIN, G.T.; RYAZHSKAYA, O.G.

Calculating the neutron production by μ-mesons for various depths in the soil. Izv. AN SSSR.Ser.fiz. 29 no.10:1946-1948 O '65. (MIRA 18:10)

ACC NR: AP6031341 SOURCE CODE: UR/0386/66/004/003/0114/0117

AUTHOR: Zatsepin, G. T.; Kuz'min, V. A.

ORG: Physics Institute im. P. N. Lebedev, Academy of Sciences, SSSR (Fizicheskiy institut Akademii nauk SSSR)

TITLE: Upper limit of the spectrum of cosmic rays

SOURCE: Zh. eksper. i teoret. fiz. Pis'ma v redaktsiyu. Prilozheniye v. 4, no. 3, 1966, 114-117

TOPIC TAGS: cosmic ray intensity, cosmic radiation composition, cosmic dust, cosmology, alpha particle, high energy interaction

ABSTRACT: On the basis of recently observed powerful isotropic thermal radiation of the Universe, having apparently a Planck distribution with temperature $T \approx 3K$, the authors show that if the characteristic time for proton-phonon collision becomes sufficiently small compared with the lifetime of high-energy cosmic rays in the Metagalaxy, as determined by other processes (for example, the expansion of the Universe), then effective cutoff of the cosmic ray spectrum will take place. The characteristic time of collision between a proton of energy $E_p \gg M_p c^2$ and a photon is calculated for different proton energies and for several photon gas temperatures ($T = 2, 3, 5, 10,$ and 30). The results show that at proton energies $E_p \gtrsim 10^{20}$ ev, proton interactions with the photon gas become quite frequent; $\tau_{p\gamma} \approx 10^7$ years. This means that at the age $t \gtrsim 10^8$ of the cosmic rays with energies under consideration, their initial spec-

Card 1/2

ACC NR: AP6031341

trum should be cut off in the high-energy region, even if the acceleration mechanism had been sufficiently effective in producing particles having these energies. The question of the exact form of the cosmic-ray spectrum in the energy region $E_p \gtrsim 10^{19}$ ev calls for a detailed analysis combined with allowance for their generation, the expansion of the Universe, and the interaction of the cosmic rays with the photon gas at each stage of evolution of the Universe. The form of the spectrum will depend on which state of evolution of the Universe the cosmic-ray particles of superhigh energy were generated, and how rapidly the generation took place. It is shown that a study of the energy spectrum of the cosmic rays near its upper limit yields information not only on the processes of their generation, but also on the evolution of the Universe. The influence of the change of the photon-gas temperature T on the position of the limit of the cosmic-ray spectrum and the disintegration of α particles and other nuclei as they pass through metagalactic space are also disscussed, and it is deduced from the rather large cross section of the latter process that the nuclei should vanish completely from the cosmic rays at energies above 10^{19} ev. Orig. art. has: 2 figures and 2 formulas. [02]

SUB CODE: 20/ SUBM DATE: 26May66/ ORIG REF: 002/ OTH REF: 004/ ATD PRESS: 5081

Card 2/2

L 08583-67 EWT(1) LJP(c)

ACC NR: AR6029460 SOURCE CODE: UR/0196/66/000/006/A008/A008

62

AUTHOR: Zatsepin, I. N.

TITLE: Experimental investigation of the topography of an inhomogeneous two dimensional magnetic field in the conducting ferromagnetic and nonmagnetic media and the verification of basic theoretically derived relationships. 2. The measurement results and magnetodynamic numerical analysis

SOURCE: Ref. zh. Elektronika i energetika, Abs. 6A58

REF SOURCE: [Tr.] In-ta fiz. metallov. AN SSSR, vyp. 24, 1965, 281-297

TOPIC TAGS: topography, nonhomogeneous magnetic field, magnetic field, field theory, numeric analysis, ferromagnetic material

ABSTRACT: Experimentally measured and theoretically derived topography and the frequency characteristics are given of the normal and tangential components of the secondary magnetic field as a function of the observer coordinates and the frequency of the primary field for a plane ferromagnetic object magnetized by the field set up by a linear current conductor. The shifts between the maxima of the normal components of the primary and the secondary dynamic fields are found. Relationships are established between the eddy current field, quasimagnetostatic field, and the measured secondary field. The vector diagrams and phase shifts are

UDC: 538.12.001.24

Card 1/2

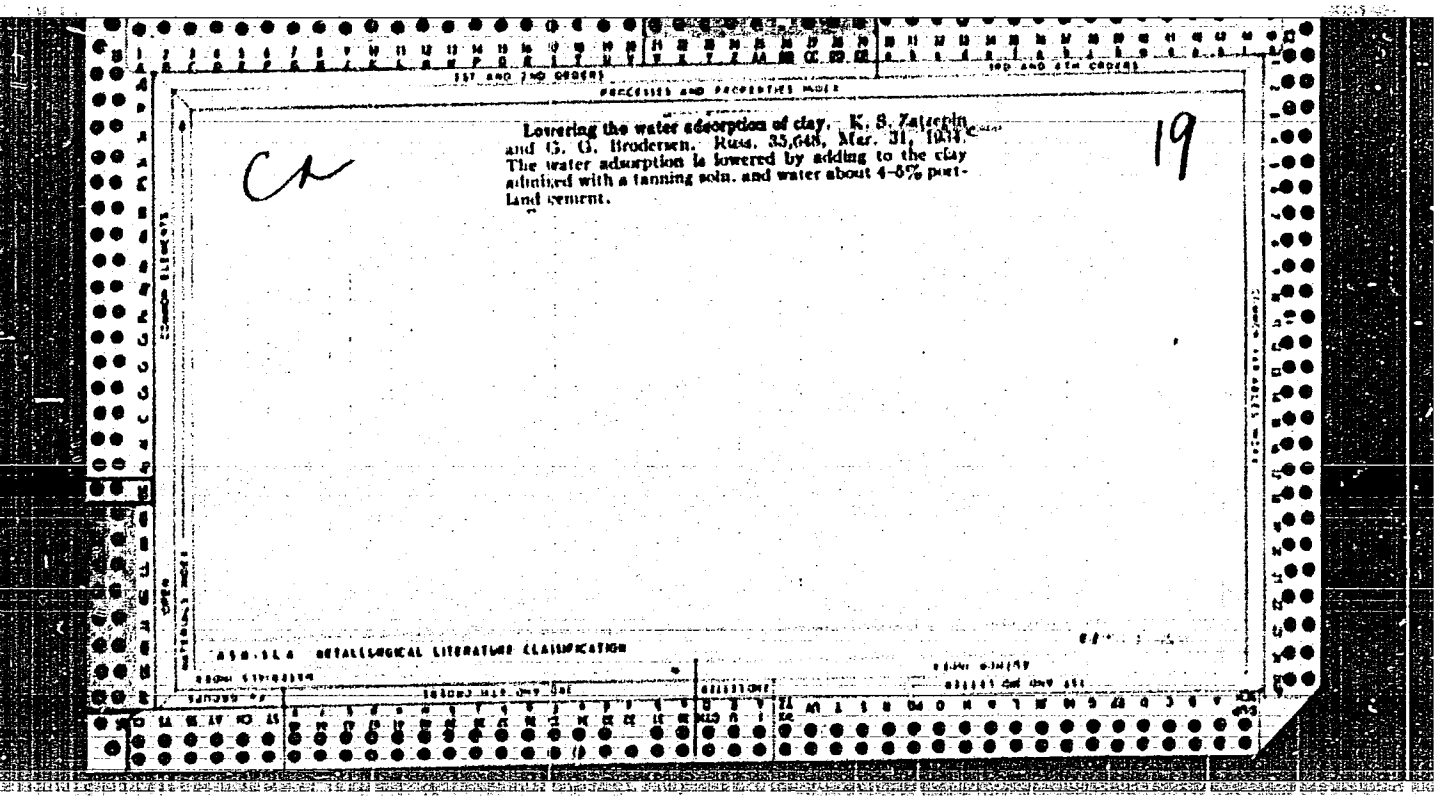
L 08583-67

ACC NR: AR6029466

studied for the primary and the normal and tangential components of the secondary field for a ferromagnetic material as functions of the space coordinates and the frequency of the primary field. The same investigation is carried out for a conducting nonmagnetic plate. The frequency and other characteristics are studied for the tangential component of the field averaged over the cross section of the ferromagnetic and nonmagnetic objects. [Translation of abstract] 23 illustrations and bibliography of 2 titles. From summary.

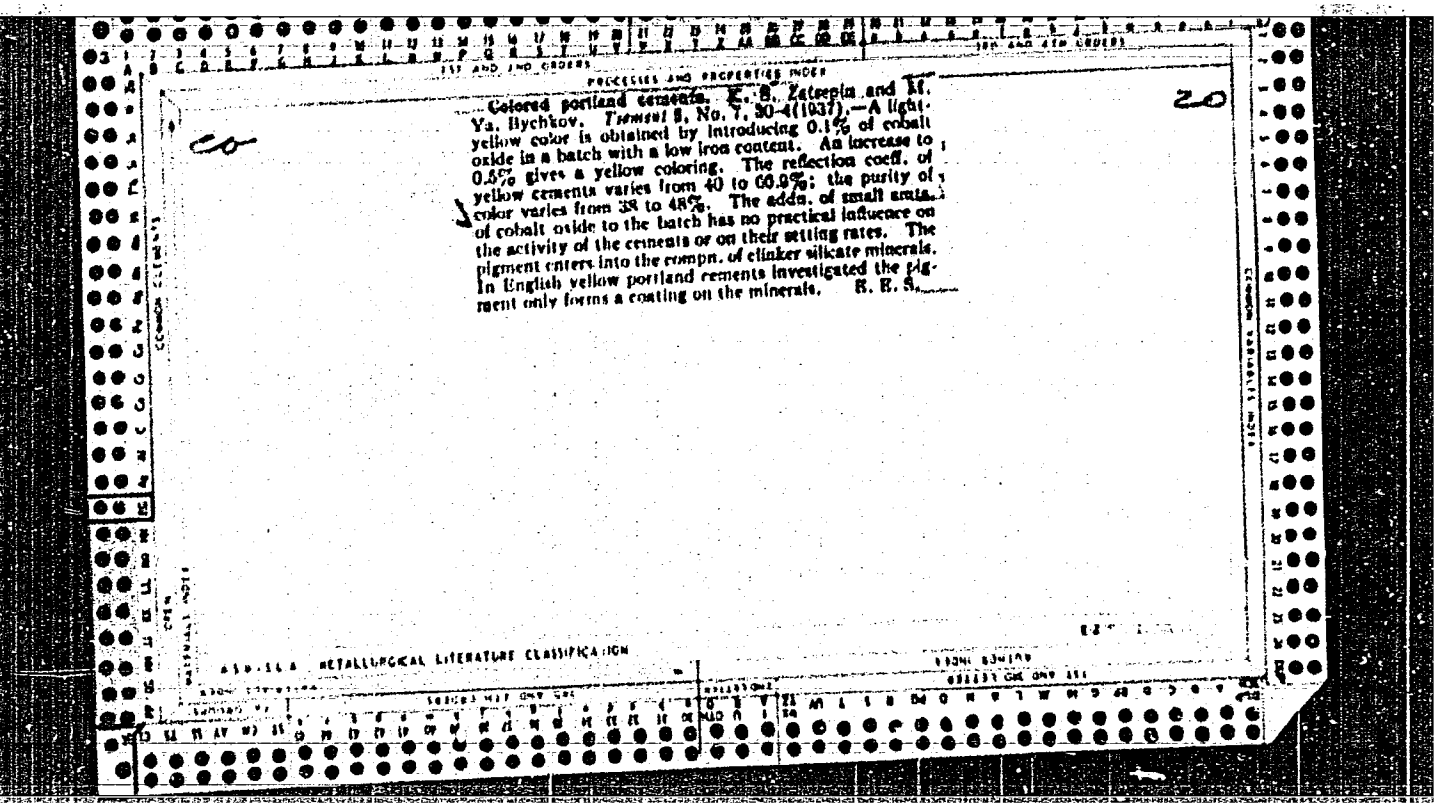
SUB CODE: 20

Card 2/2



Lowering the water adsorption of clay. K. S. Zaitsevin and G. G. Brodersen. Russ. 35,648, Mar. 31, 1934. The water adsorption is lowered by adding to the clay admixed with a tanning soln. and water about 4–5% Portland cement.

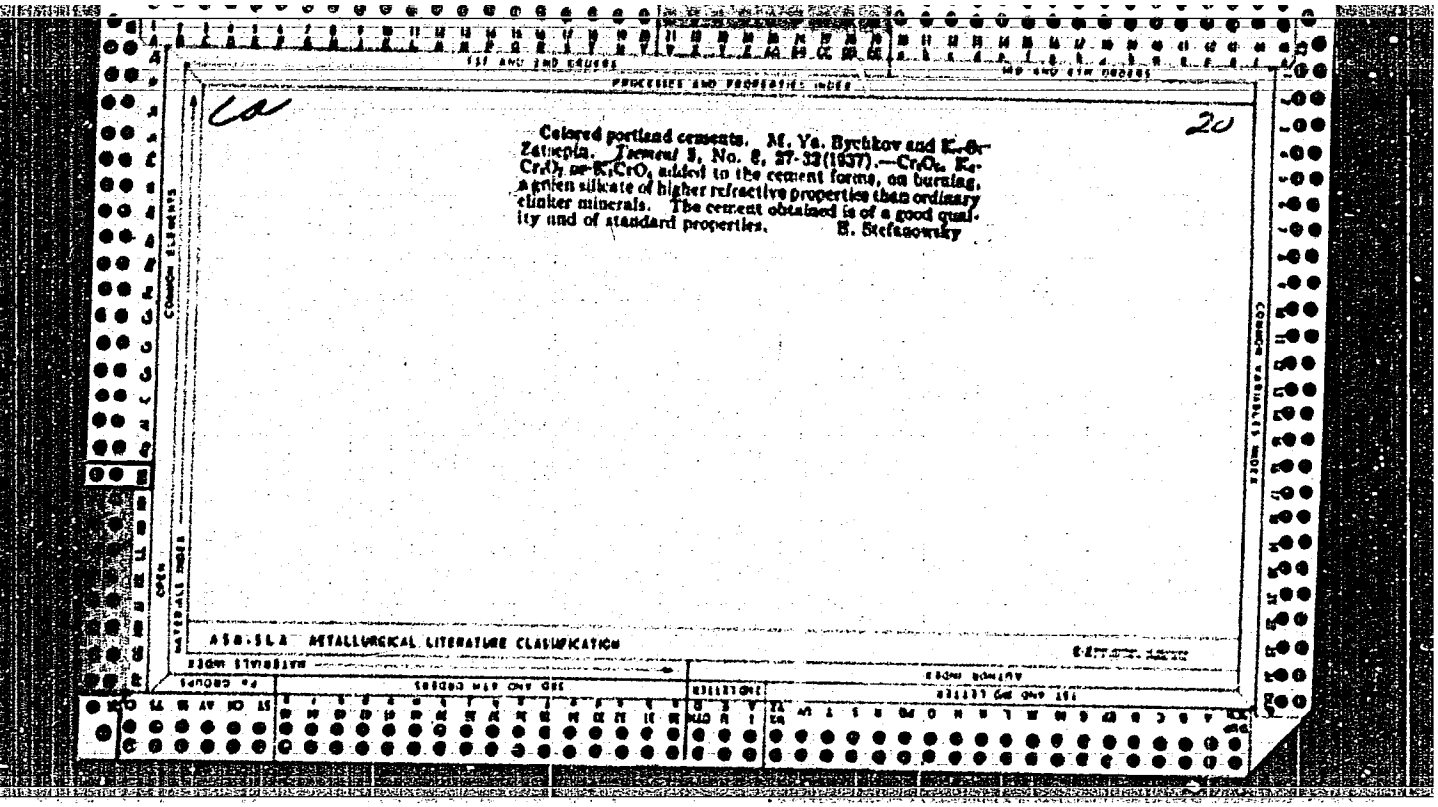
19



PROCESSES AND PROPERTIES INDEX

Colored portland cements. E. S. Zatsepin and M. Ya. Bychkov. *Tsement* 8, No. 1, 30-4(1937).—A light-yellow color is obtained by introducing 0.1% of cobalt oxide in a batch with a low iron content. An increase to 0.5% gives a yellow coloring. The reflection coeff. of yellow cements varies from 40 to 60.9%; the purity of color varies from 38 to 48%. The addn. of small amts. of cobalt oxide to the batch has no practical influence on the activity of the cements or on their setting rates. The pigment enters into the compn. of clinker silicate minerals. In English yellow portland cements investigated the pigment only forms a coating on the minerals. R. E. S.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

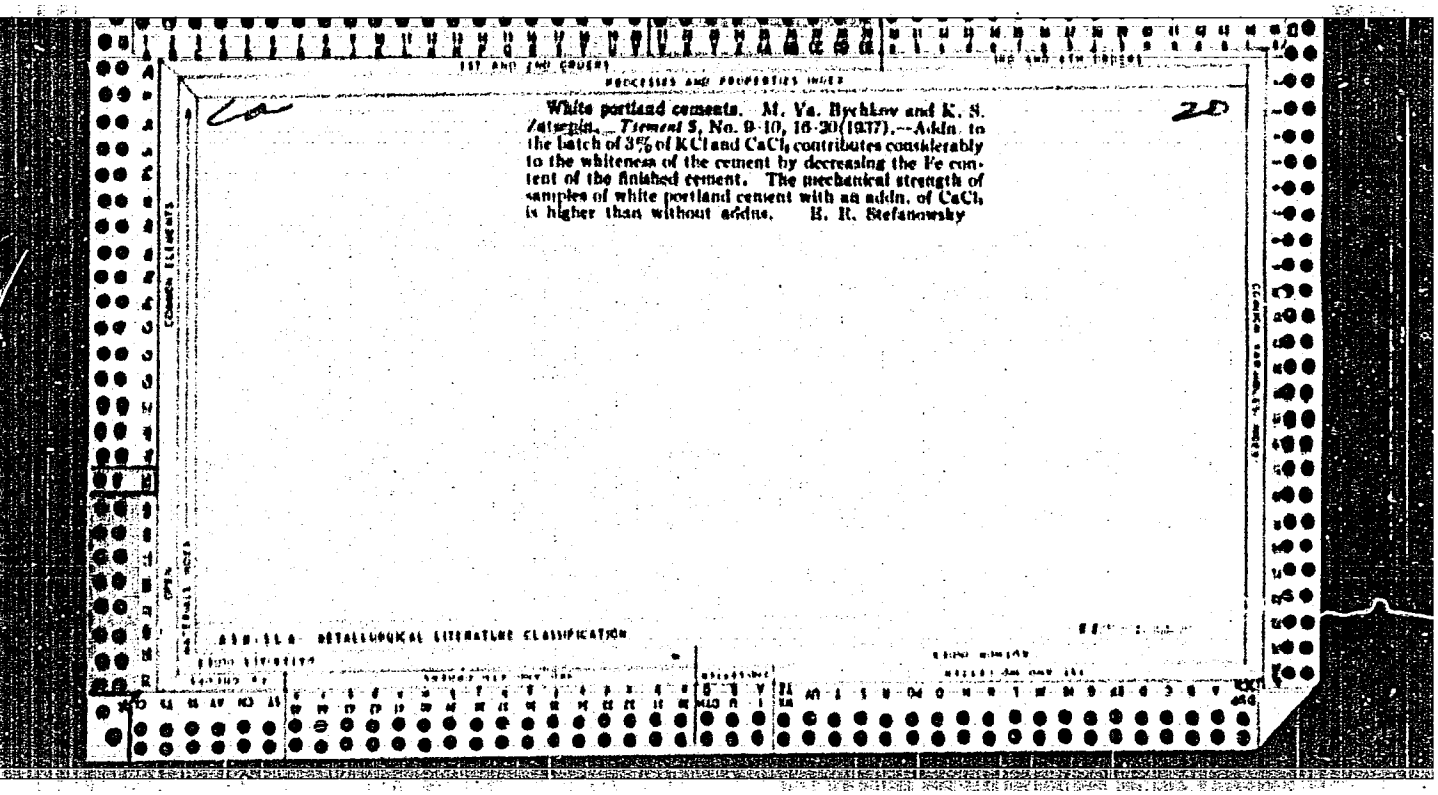


Ca

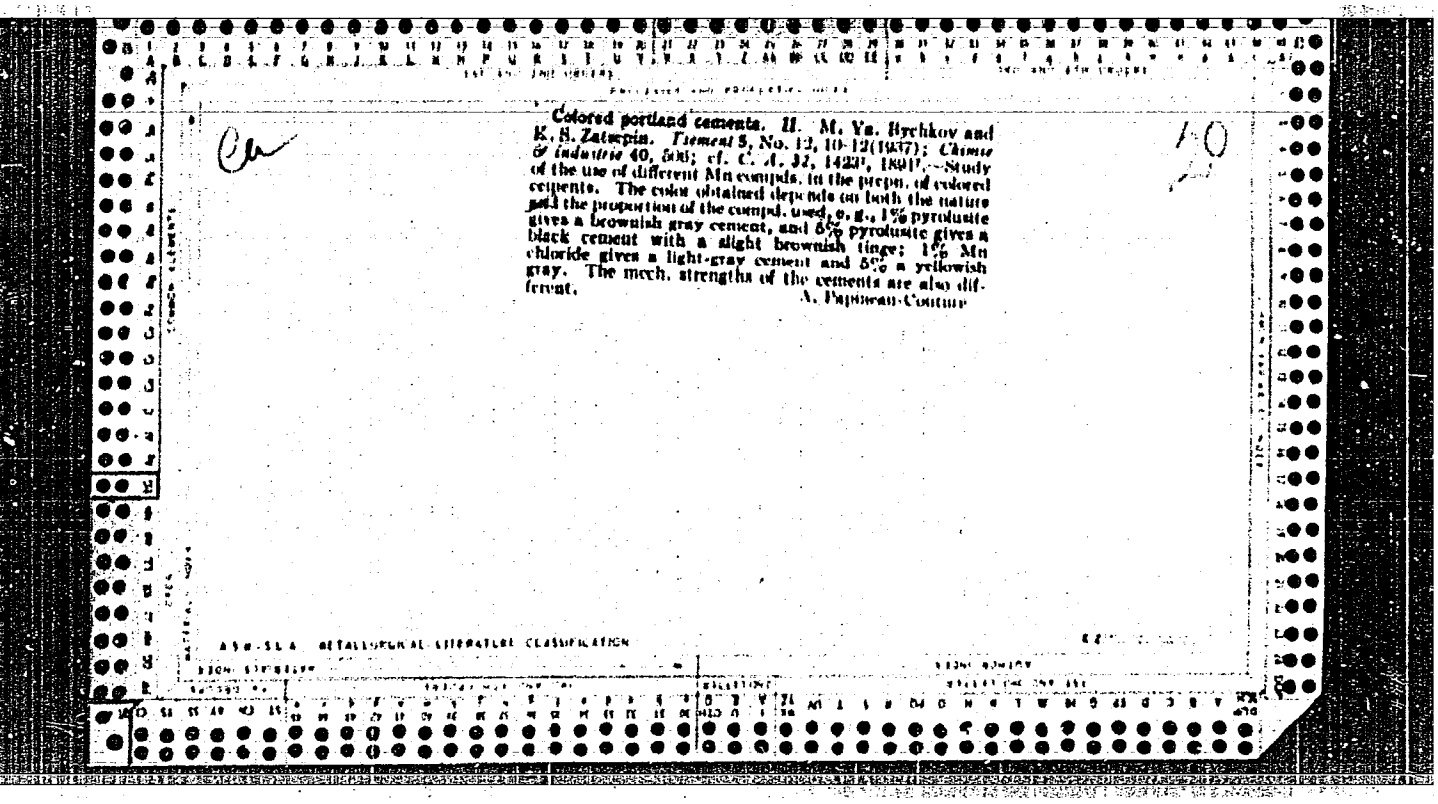
20

Colored portland cements. M. Ya. Bychkov and K. Ol-Zaitsepin. *Tsement* 5, No. 6, 27-32 (1937).—Cr_2O_3, $K_2Cr_2O_7$, or K_2CrO_4 added to the cement forms, on burning, a green silicate of higher refractive properties than ordinary clinker minerals. The cement obtained is of a good quality and of standard properties. B. Stefanowsky

ASB-SLA METALLURGICAL LITERATURE CLASSIFICATION



White portland cements. M. Va. Bychkov and K. S. Zatsepin. *Tsement* 5, No. 9-10, 16-20(1937).--Addn. to the batch of 3% of KCl and CaCl$_2$ contributes considerably to the whiteness of the cement by decreasing the Fe content of the finished cement. The mechanical strength of samples of white portland cement with an addn. of CaCl$_2$ is higher than without addns. B. R. Stefanowsky



Colored portland cements. II. M. Ya. Bychkov and K. S. Zatsepin. *Tsement* 5, No. 12, 10-12(1937); *Chimie & industrie* 40, 508; cf. *C. A.* 32, 1423⁹, 1891.—Study of the use of different Mn compds. in the prepn. of colored cements. The color obtained depends on both the nature and the proportion of the compd. used, e. g., 1% pyrolusite gives a brownish gray cement, and 5% pyrolusite gives a black cement with a slight brownish tinge; 1% Mn chloride gives a light-gray cement and 5% a yellowish gray. The mech. strengths of the cements are also different.

A. Papineau-Couture

ZATSEPIN, K. S.

Building Materials

Manufacture of building materials from carbonated lime. Gor. khoz. Mosk. 26 no. 4:7-11 Ap '52

Monthly List of Russian Accessions, Library of Congress, July 1952. Unclassified.

ZATSEPIN, K. S.

Dissertation: "Production of Carbonized Blocks for Walls and Facings." Cand Tech Sci, Inst of Construction Engineering, Academy of Architecture USSR, Moscow, 1953. (Referativnyy Zhurnal--Khimiya, No 5, Mar 54)

SO: SUM 243, 19 Oct 1954

ZATSEPIN, K. S.

GAVRIKOVA, A. N. - tekhnik i, BORISOVA, K. S. - inzh., ZATSEPIN, K. S. - inzh.

Nauchno-issledovatel'skiy institut po stroitel'stvu Ministerstva neftyanoy promyshlennosti

RAZRABOTKA PROMYSHLENNOY TEKHNOLOGII IZVESTKOVYKH KARBONIZIROVANNYKH MATERIALOV
Page 104

SO: Collection of Annotations of Scientific Research Work on Construction, completed in 1950, Moscow, 1951

ZATSEPIN, K. S.

LEYRIKH, V. E. Inzhener i ZAVYALOV, I. N. Inzh., BISHNEVSKIY, YE. YE. Inzh. GRINGAUZ, R. I. Inzh., ZATSEPIN, K. S. Inzh

Nauchno-issledovatel'skiy institut po stroitel'stvu Ministerstva neftyanoy promyshlennosti

RAZRABOTKA I VNEDRENIYE PROMYSHLENNOY TEKHNOLOGII POLUCHENIYA TEPLOIZOLYATSIONNYKH BEZOBZHIGOVYKH DINATEMOVYKH MATERIALOV Page 111

SO: Collections of Annotations of Scientific Research Work on Construction, completed in 1950. Moscow, 1951

ZATSEPIN, K. S.

ZATSEPIN, K. S., Inzhener i GRINGAUZ, R. I., Inzh.

Nauchno-issledovatel'skiy institut po stroitel'stvu Ministerstva neftyanoy promyshlennosti

IZUCHENIYE LENINGRADSKIKH I URAL'SKIKH DIATOMITOV

Page 111

SO: Collection of Annotations of Scientific Research Work on Construction, completed in 1950, Moscow, 1951

GIL'MAN, T.P.; ZATSEPIN, K.S.; PUZAKOVA, N.D.; BUKHTIYAROV, N.T.

Device for studying the kinetics of the wetting of glass fillers with binders. Plast. massy no.8:53-55 '65. (MIRA 18:9)

ZATSEPIN, K.S.; BUKHTIYAROV, N.T.

Pipelines of glass-reinforced plastic for transporting gas, petroleum, and petroleum products. Stroi.truboprov. 9 no.2: 9-12 F '64. (MIRA 17:3)

1. Vsesoyuznyy nauchno-issledovatel'skiy institut po stroitel'stvu magistral'nykh truboprovodov.

PODKLETNOV, Ye.N., inzh.; ZATSEPIN, K.S., kand.tekhn.nauk

Enameled gas and petroleum pipes. Stroi. truboprovod. 6 no.8: 28-29 Ag '61. (MIRA 14:8)
(Pipe, Steel) (Enamel and enameling)

ZATSEPIN, K.S., kand.tekhn.nauk

Production and use of polyvinylchloride pipes in the German Democratic Republic. Stroi. truboprov. 5 no.10:30-31 O'60. (MIRA 13:10)

(Germany, East--Pipe, Plastic)

37640
S/143/62/000/004/002/006
D238/D307

26.2120

AUTHORS: Zaryankin, A.Ye., Candidate of Technical Sciences, and Zatsepin, M.F., Engineer

TITLE: The influence of losses in the working disc on the efficiency of a radial-axial turbine

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy. Energetika, no. 4, 1962, 79 - 84

TITLE: Due to the relative absence of direct experimental data regarding the influence of the working disc on the efficiency of a radial-axial turbine and bearing in mind the extent to which the aerodynamic properties of the working disc largely govern the efficiency of the turbine stage, a study is made of some theoretical concepts and experimental data affording an assessment of the influence of the loss factor and involution of the discharge edges of the working disc on the efficiency of this type of turbine. Efficiency is studied on the basis of

$$\eta = 2(c_{1u}u - c_{2u}u_2)/c_o^2 \qquad (1)$$

Card 1/2

where c_{1u} and c_{2u} is the peripheral projection of the absolute velocities; u is the peripheral velocity at inlet and discharge from the disc; c_0 is an arbitrary velocity corresponding to the heat transfer available. Since this equation is generally complex, the study is made on a stage with relative velocities connected by the relation $\omega_{2t} = \omega_1$. The effect of disc losses on turbine stage efficiency is largely a function of the degree of radial orientation of the disc and the blade angle. The effect diminishes markedly with a small entry-to-discharge diameter ratio ν and increased blade egress angle. In radial-axial- and radial stages with a geometric parameter $\nu < 0.4$ the straight radial blade with egress angle 90^0 is the most effective and the profile is significant only for $\nu > 0.4$. Radial stage efficiency is best served by designing for minimum reactivity taking $\rho = (1.1 \text{ to } 1.2)\, x_0(1 - \nu^2)$, where x_0 is the ratio of peripheral speed at the tip of a disc to the arbitrary velocity c_0.

There are 5 figures.

ASSOCIATION: Moskovskiy ordena Lenina energeticheskiy institut (Moscow 'Order of Lenin' Institute of Power Engineering)

SUBMITTED: May 4, 1961

Card 2/2

ZARYANKIN, A.Ye., kand.tekhn.nauk; ZATSEPIN, M.F., inzh.; NIKITIN, V.N.

Experimental study of radial and radial-axial stages. Izv. vys. ucheb. zav.; energ. 4 no.8:60-66 Ag '61.
(MIRA 14:8)

1. Moskovskiy ordena Lenina energeticheskiy institut.
(Steam turbines)

ZARYANKIN, A.Ye., kand.tekhn.nauk; ZATSEPIN, M.F., kand.tekhn.nauk

Effect of gaps between the housing and rotor wheel on the efficiency of a Francis-type turbine stage. Energomashinostroenie 10 no.3: 33-35 Mr '64. (MIRA 17:4)

26.2120

37554
S/096/62/000/005/001/009
E194/E454

AUTHORS: Zaryankin, A.Ye., Candidate of Technical Sciences, Sherstyuk, A.N., Candidate of Technical Sciences, Zatsepin, M.F., Engineer

TITLE: Some ways of increasing the efficiency of mixed flow turbines

PERIODICAL: Teploenergetika, no.5, 1962, 32-35

TEXT: At low pressure ratios (1.7 to 1.8) the efficiency of mixed flow turbines is around 80%, which it is important to increase because small gas turbines of this type are widely used. When the ratio of the blade width to diameter is below 0.05 appreciable losses occur at discharge from the nozzles and runner and due to disc friction. Nozzle efficiency can be increased by meridional profiling, that ismachining the blade with a twist in it, which reduces the speed and final pressure drops in the region of maximum curvature of gas flow. However, in some cases meridional profiling, whilst reducing the losses at subsonic speeds may increase them at supersonic speeds and whilst potentially very advantageous, the subject requires much further experimental study.
Card 1/3

S/096/62/000/005/001/009
E194/E454

Some ways of increasing ...

Under certain conditions the use of profiled shrouding in an experimental turbine increased the efficiency by 4%. When the blades are very wide the spatial distribution of flow becomes important and under unfavourable conditions, although the flow is generally convergent, there may be divergent regions in the runner and the discharge velocity distribution may be very irregular, particularly when discharge velocity losses are high. Meridional guide vanes are usually designed to ensure the requisite change in cross-sectional area, but it is also important that they be smooth and with gradual changes of curvature. The runner blades too should have very gradual changes of curvature and should not have straight sections which can give rise to zones of divergent flow. Runner friction losses may be reduced by increasing the pressure drop in the stage. The value of the angle α_1 at which the flow breaks away depends mainly on the number of blades and relatively little on the twist of the discharge edge or the shape of the meridional guide. Discharge velocity losses may be high in a radial-axial stage even under design conditions and, therefore, the velocity of discharge should

Card 2/3

be converted in the subsequent diffuser section. If the turbine discharges to atmosphere a diffuser can reduce the pressure behind the runner so increasing the actual stage heat drop and increasing stage efficiency. Axially symmetrical diffusers directly beyond the runner are best but the discharge flow is often irregular and then diffusers which operate well under uniform flow conditions are not always best. For instance, in practical tests a curved diffuser was found better than a conical one although static tests showed them to have equal performance. There are 7 figures.

ASSOCIATION: Moskovskiy energeticheskiy institut
(Moscow Power Engineering Institute)

Card 3/3

24.2170

27648
S/024/61/000/004/006/025
E194/E155

AUTHORS: Zaryankin, A.Ye., and Zatsepin, M.F. (Moscow)

TITLE: The influence of the radial gap on the efficiency of a radial-axial turbine

PERIODICAL: Izvestiya Akademii nauk SSSR, Otdeleniye tekhnicheskikh nauk, Energetika i avtomatika, 1961, No.4, pp. 32-36

TEXT: The radial gap between the discharge edges of the nozzle gear and the inlet edges of the runner is often selected arbitrarily. On the one hand, as this gap is increased the velocity distribution before the runner becomes more uniform, which reduces the inlet losses and also reduces the losses in the ducts between the nozzle blades. However, increasing the gap increases frictional losses in the flow moving over the end walls of the annular ducts. In order to assess the order of magnitude of each of these kinds of loss, the flow between two plain walls in the annular gap is considered mathematically. Theory and static tests on radial turbine nozzles show that at low Mach numbers the flow in the annulus moves approximately in logarithmic spirals and the current lines are expressed in polar coordinates by the relation:

Card 1/6

$$r = r_0 \exp(-\varphi \operatorname{tg} \alpha_1) \qquad (1)$$

where: r_0 is the radius of the discharge edges of the nozzle; α_1 is the angle of discharge of flow from the nozzles; r is the instantaneous radius of the line of flow; φ is the polar angle. The change of speed along the flow line is determined by the following expression:

$$\frac{c}{c_0} = \frac{r_0}{r} = \exp(\varphi \operatorname{tg} \alpha_1) \qquad (2)$$

where c_0 is the speed at discharge from the nozzle.
Knowing the flow lines and the speed, the following expression between the speed c and the instantaneous length of the segment of the logarithmic spiral contained between radii r_0 and r is given by:

$$\frac{c}{c_0} = \frac{1}{1 - \frac{S}{r_0} \sin \alpha} \qquad (5)$$

The following expression is then derived for the increased thickness of the layer of loss of impulse along a flow line in the gap:

Card 2/ 6

The influence of the radial gap on ...

$$\bar{\delta}^{**} = \frac{0.342}{\sqrt{Re_1 \sin \alpha_1}} \sqrt{1 - \frac{1}{(1 + \bar{\Delta}_3)^{3.75}}} \qquad (8)$$

where Δ_3 is the length of the radial gap. From these expressions the change in impulse loss with change in radial gap can be calculated. The curve of

$$\sqrt{Re_1 \sin \alpha_1} = f(\bar{\Delta}_3)$$

plotted in Fig.2 shows that as the gap length increases the thickness of impulse loss layer in the gap first increases markedly, but later the increase slows off, and when $\bar{\Delta}_3$ is between 0.3 and 1, $\bar{\delta}^{**} \sqrt{Re_1 \sin \alpha_1}$ alters only by 0.05. This shows that the gap affects the frictional losses only in the range of $\bar{\Delta}_3$ from 0 to 0.3. This characteristic is of general validity as it does not depend on the Reynolds number or the flow discharge angle α_1. The method of calculating the change in thickness of the impulse loss layer in the annular gap in any specific case is then explained. In particular, a correction factor k_3 is derived to

Card 3/ 6

allow for the work of pressure forces which is usually not allowed for in calculating losses from the final characteristic of the boundary layer. The following expression is then derived for the coefficient of energy loss in the gap:

$$\zeta_3 = \frac{3.6\,\bar{\delta}_1^{**}\,(1-\theta)\,k_3}{\bar{l}} \qquad (12)$$

where: θ is the degree of reaction of the turbine; $\bar{l} = l/r_1$ is the relative height of the nozzle gear. To facilitate use of this formula, Fig. 2 shows the relationship

$$\delta^{**} k_3 \sqrt{Re_1 \sin\alpha_1}$$

as a function of the gap length $\bar{\Delta}_3 = \Delta_3/r_1$. These curves permit ready calculation of additional frictional losses in the gap. Similar calculations for the turbulent boundary layer give the following expressions for the thickness of the impulse loss layer:

$$\bar{\delta}_m^{**} = \frac{0.00656}{Re_1^{1/7} \sin^{6/7}\alpha_1}\left[1 - \frac{1}{(1+\bar{\Delta}_3)^{7.8}}\right]^{6/7} \qquad (13)$$

Card 4/ 6

The influence of the radial gap on ...

In using expression (12), $\bar{\delta}''$ is determined by Eq.(13). Comparison of curves plotted by expression (12) with experimental data shows generally good agreement but expression (12) gives a greater drop of efficiency than experiment. The reasons for this are discussed. As the gap length is increased, the part played by the nozzle gear continually diminishes, since the main acceleration of the flow is transferred to the radial gap. With large gaps, nozzle guide vanes should be used only to give the flow the required direction in the annular gap. In this case formula (12) gives an accurate solution of the problem and it may be used to consider the question of use of bladeless nozzle equipment. Test results are quoted which show that the use of bladeless nozzle gear gives a gain only for small values of Reynolds number. However, with relatively short blades the use of profiled shrouding affords considerable advantages as compared with bladeless nozzle gear. Thus it is recommended to use bladeless nozzle gear at low speeds when $\bar{\delta}'' \geq 0.10$. In other cases it is better to have nozzle gear with blades and a minimum gap, using profiled shrouding.
There are 5 figures and 3 Soviet references.
SUBMITTED: March 17, 1961
Card 5/6

L 37079-66 EWP(k)/EWT(m)/T-2/EWP(w)/EWP(v) IJP(c) EM

ACC NR: AP6012434 (N) SOURCE CODE: UR/0143/65/000/011/0030/0035

AUTHORS: Zaryankin, A. Ye. (Candidate of technical sciences, Docent); Zatsepin, M. F. (Candidate of technical sciences)

ORG: Moscow Power Engineering Institute (Moskovskiy energeticheskiy institut)

14
B

TITLE: Some results of improving turbine exhaust passages

SOURCE: IVUZ. Energetika, no. 11, 1965, 30-35

TOPIC TAGS: gas turbine, exhaust gas dynamics

ABSTRACT: The effects of changing the exhaust diffuser parameters on stage efficiency of medium- and small-sized gas turbines were experimentally investigated. The diffuser geometry was varied as shown in Fig. 1 with α at 8, 11, and 14° and expansion ratios of 1.51 (original design) to 2.74 ($D/\ell_1 = 6$, $L/\ell_1 = 3.5$--4, D = inlet diameter, L = diffuser length). The experiments were performed using the integral method as previously described by A. Ye. Zaryankin (O metodike integral'nykh ispytaniy diffuzorov i vykhlopnykh patrubkov. Teploenergetika, No. 3, 1962). Curves of the loss coefficient as a function of expansion ratio, expansion angle, and inlet Mach number (0.2--0.6) are presented for diffuser with and without collection spiral. It was found that diffuser losses could be reduced by 36% and that ≈ 30% of the kinetic energy could be recovered by increasing the expansion ratio from 1.51 to 2.3--2.8 and the expansion

UDC: 621.438

Card 1/2

L 37079-66

ACC NR: AP6012434

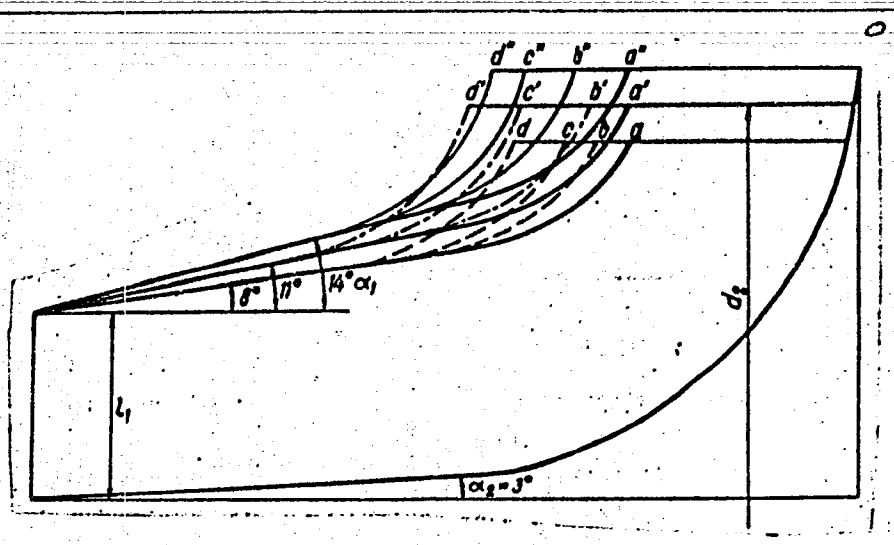


Fig. 1. Diffuser geometries.

angle from 8 to 13--15°. Substantial losses (13--22%) are attributable to the exhaust spiral; the diffuser has to be properly matched. Orig. art. has: 4 figures, 1 formula, and 1 table.

SUB CODE: 21/ SUBM DATE: 18May64/ ORIG REF: 001

Card 2/2

L 38502-66

ACC NR: AP6019729 SOURCE CODE: UR/0096/66/000/007/0029/0032

AUTHOR: Zaryankin, A. Ye. (Candidate of technical sciences); Zatsepin, M. F. (Candidate of technical sciences); Shakh, R. K. D. (Engineer)

ORG: Moscow Power Institute (Moskovskiy energeticheskiy institut)

46
B

TITLE: Effect of geometric parameters on the operation of annular axial-radial diffusers

SOURCE: Teploenergetika, no. 7, 1966, 29-32

TOPIC TAGS: diffuser design, gas turbine, DIFFUSER FLOW

ABSTRACT: All experiments were carried out with air at constant values of the M and Re numbers equal, respectively, to 0.3 and 5×10^5. Five series of diffusers were investigated. The dimensionless geometric parameters of the diffusers, the optimum degree of expansion, and the minimum values of the losses are given in a table. In the first series of experiments, a study was made of the form of the flow-through section, which is characterized by the ratio of the radii, r_2/r_1. (See Fig. 1) The results of this series of experiments are shown in a figure which illustrates the dependence of the total losses on the dimensionless radius. Further figures, based on experimental data, illustrate the

Card 1/2 UDC: 621.165.621.43.06.001.5

L 38502-66
ACC NR: AP6019729

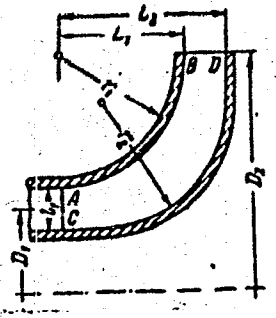


Fig. 1. Diagram of axial-radial diffuser

dependence of the losses on the axial length, the change in the losses as a function of the "radial character" of the diffuser, the dependence of the losses on the degree of expansion, and the effect of the form of the contours on the losses. Orig. art. has: 6 figures and 1 table. [06]

SUB CODE: 21/ SUBM DATE: none/ ORIG REF: 002

pb

Card 2/2

DEYCH, M. Ye., doktor tekhn. nauk, prof.; ZARYANKIN, A. Ye., kand. tekhn. nauk; ZATSEPIN, M.F., kand. tekhn. nauk

Results of the tests of exhaust outlets with obliquely cut diffusers. Teploenergetika 11 no.12:46-50 D '64 (MIRA 18:2)

1. Moskovskiy energeticheskiy institut.

ZARYANKIN, A.Ye.; ZATSEPIN, M.F.

Results of the study of conical and annular diffusers. Trudy MEI no.47:105-116 '63. (MIRA 17:1)

ACCESSION NR: AR4015127 S/0124/63/000/012/B040/B041

SOURCE: RZh. Mekhanika, Abs. 12B231

AUTHOR: Zaryankin, A.Ye.; Zatsepin, M.F.

TITLE: Results of studies of conic and ring diffusers

CITED SOURCE: Tr. Mosk. energ. in-ta, vy*p. 47, 1963, 105-116

TOPIC TAGS: diffuser, conic diffuser, ring diffuser

TRANSLATION: The authors examine the effects of various parameters on the losses in conic and ring diffusers. Losses in a conical diffuser are described by the functional dependence $\zeta = f(\alpha, n, M, R)$, where α is the aperture angle, $n = F_k/F_H$ is the degree of diffusor expansion (F_k and F_H are the areas at the inlet and outlet, respectively), M and R are Mach and Reynolds numbers. The presence of breakoff complicates the study of flow. For non-breakoff diffusers, the losses computed on the basis of boundary layer theory are determined by parameters n, α, R, and M.

Card 1/3

ACCESSION NR: AR4015127

1. The effect of the degree of expansion n. Experiments show that the increase in n with a constant angle φ and a constant velocity at the inlet leads to a considerable increase in losses. This is associated with the increase in the integral boundary layer thicknesses. The evaluation for $\varphi = 10^\circ$ shows that the losses increase most intensively with small values of n, whereupon their growth diminishes. The results cannot be extrapolated for large n, when breakoff occurs. The study showed that $n > 2.5$ is inadvisable.

The effect of φ. The increasing of φ leads to a reduction of the losses until the breakoff of the flow; in the presence of breakoff the losses increase. Experiments with $n = 3.55$ have shown that breakoff occurs with $\varphi > 11^\circ$. Economically, it is advisable to make use of diffusers with limiting expansion angles.

3. The effect of the number R. With non-breakoff flow, the effect of the number R is not significant. In the presence of breakoff, the Reynolds number affects not only the integral thicknesses, but also the position of the breakoff point.

4. The effect of the number M. Increasing the number M leads to increases in the displacement thicknesses in the initial portion of the diffusor and their reduction toward the outlet. With small angles (8.30° and 16.20°), the losses for $M < 0.5$ remain practically unchanged, increasing sharply with $M > 0.6$. With

Card 2/3

ACCESSION NR: AR4015127

increasing α, losses grow with smaller numbers M. This is due to the increase in the velocity gradient in the initial portion of the diffuser, which leads to the possibility of breakoff. The breakoff which does occur has a nonstationary character, and the breakoff frequency increases with the M number.

The ring diffuser in most cases constitutes a channel between two coaxial conical surfaces. Losses in such a diffuser may be expressed in terms of the conical diffuser losses, although in place of n it is more convenient to introduce the argument l/D, where l is the height of the ring channel at the inlet and D is the ring diameter. It was found that losses increase with decreasing l/D. The effect of the aperture angle α is also considered. Yu.P. Lun'kin.

DATE ACQ: 31Dec63 SUB CODE: MM ENCL: 00

Card 3/3

ZARYANKIN, A.Ye. (Moskva); ZATSEPIN, M.F. (Moskva)

Effect of a radial gap on the efficiency of a radial-axial turbine. Izv. AN SSSR. Otd. tekh. nauk. Energ. i avtom. no.4:32-36 Jl-Ag '61. (MIRA 13:9)

(Turbines)

28572
S/143/61/000/008/003/005
D203/D305

26.2120

AUTHORS: Zaryankin, A.Ye., Candidate of Technical Sciences, Zatsepin, M.F., and Nikitin, V.N., Enfineers

TITLE: An experimental investigation of the radial and radial-axle stages

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy. Energetika, no. 8, 1961, 60-66

TEXT: The experiments were carried out with an experimental turbine type МЭИ(MEI) shown in Fig. 1. The air was supplied to the turbine from a blower (1 and 3 atmospheres) and a temperature of 200°C, through the meter nozzle 14. The power developed by the turbine was consumed by the three-stage hydro-brake. The demand for the air was calculated from

$$G = A\sqrt{\Delta p_c \frac{p_c}{T_c}} \qquad (1)$$

Card 1/8

An experimental investigation ...

where Δp_c is the pressure drop on the nozzle, p_c - the pressure before the nozzle, T_c - the temperature. The efficiency and magnitude of the reaction was calculated from the known expressions

$$\eta_{0i} = \frac{M\ n}{980\ G\ T_0\left[1 - \left(\frac{p_2}{p_0}\right)^{0,286}\right]} \qquad (2)$$

and

$$\rho = \frac{\left(\frac{p_1}{p_0}\right)^{0,286} - \left(\frac{p_2}{p_0}\right)^{0,285}}{1 - \left(\frac{p_2}{p_0}\right)^{0,286}} \qquad (3)$$

Card 2/9

An experimental investigation ...

Four stages were investigated in the experimental turbine, differing only by the rotors working with the same nozzle apparatus. The profile MEI, Ts-2r was taken as a basis, having an angle $\alpha_{1\ ef}$ = 15^{o} with the relative pitch $\frac{t}{b}$ = 0.64. The rotors are shown. The first three rotors had the same peripheries and the radial blades at the inlet had the same outlet diameter. The fourth wheel was of radial type only and the curved blades with the outlet edges were of diameter d_2= 78 mm. The number of blades were 16 on the first wheel, 12 on the second and third wheel and 18 on the fourth wheel. The edges of the first wheel had a variable angle β_2 equal to 56^{o} at the root and 1^{o} at the top. The second wheel had the curved outlet edges ($\beta_2 1 = 90^{o}$). The internal efficiency $\frac{u_1}{c_o}$ is also shown graphically. The best result was obtained with the wheel No. 1 which showed for $\frac{u_1}{c_o}$ = 0.55 to 0.65 an efficiency of

Card 3/ 9

An experimental investigation ...

80-83%, and with the improved helix even 84%. The reaction for wheel No. 1 varied considerably with the variation of $\frac{u}{C_o}$ and was found to depend on the method of sealing the rotor. A graph shows that the lack of sealing on the rear side of the working wheel diminishes the reaction by 8%, and with an increase of $\frac{u}{C_o}$, there is a considerable increase of reaction. The investigation of the radial stage No. 4 showed that its efficiency was somewhat lower than that of the radial axle stage No. 1, although they had the same ratio $\frac{d_2}{d_1}$, and zero curvature at the outlet ($C_{zn} = 0$). The losses at the outlet velocity in a radial stage were 1.6 times greater than those in a radial axle stage. The dependence of the reaction magnitude on the ratio $\frac{u_1}{C_o}$ for wheel No. 4 was found to be of different quality. For a known value of reaction, the output and the coefficient of velocity of a radial turbine, the mean

Card 4/ 9

An experimental investigation ....

angle α_1 of the outlet of the flow are determined from the following expressions,

$$c_{m1} = \frac{G}{2\pi r_1 l_1 \gamma_1} \qquad (4)$$

$$c_1 = 91{,}5\varphi\sqrt{(1-\rho)H_0} \qquad (5)$$

where l - the height of the nozzle, r_1 the radius of the outlet edges of the nozzle.

$$\sin\alpha_1 = \frac{c_{m1}}{c_1} = \frac{G}{575\, r_1 l_1 \gamma_1 \varphi \sqrt{(1-\rho)H_0}} \qquad (6)$$

Card 5/ 9

is then derived. Denoting γ_1 in terms of the temperature and pressure

$$\sin\alpha_1 = 0{,}5\,\frac{GT_0\left[1-3{,}5\varphi^2(1-\rho)H_Q\right]}{r_1 l_1 \varphi p_1 \sqrt{(1-\rho)H_0}} \qquad (7)$$

is obtained. It follows from Eq. (7) that the outlet angle depends on the losses in the nozzle apparatus and increases with the increase of φ. However, the mean angle on the axle type turbines differs from the local angles of the flow outlet because of the greater irregularity of the flow. In the radial turbines, this difference is insignificant and the angle α could be taken as an aerodynamic angle of the flow outlet from the nozzle lattice. The gap flow in the direction of the rotor moves as a logarithmic spiral with an almost constant angle α_1. There is a further acceleration of the flow, whose magnitude depends on the radius of the

nozzle installation and on the relative size of the radial gap. The size of this gap depends on the profile type and on the relative height of the nozzle apparatus $l_1 = \frac{l_1}{d_1}$. The increase of the flow width of the gap is accompanied by an increase in losses, caused by internal friction and the friction against the face wall of the ring gap. With an increase of the gap, the role of temperature drop in the nozzle apparatus decreases, whereas the temperature drop in the ring gap increases. It follows that with good aerodynamic profiles with small relative heights $l_1<0.1$, a sharp decrease of the optimal gap takes place. The experiments resulted in the following conclusions: 1) The investigated curvatures of the outlet blade-edges proved their useful justification; 2) A comparison of the radial axle and radial stages showed that with a good profile, their efficiency could be of the same oder; 3) The theoretical and experimental investigation of the influence of the radial gap showed that its increase under the specified conditions could be fully justified. There are 6 figures and

Card 7/9

28572
S/143/61/000/008/003/005
D203/D305

An experimental investigation ...

2 Soviet-bloc references-

ASSOCIATION: Moskovskiy ordena Lenina energeticheskiy institut (Moscow Order of Lenin Institute of Energetics)

SUBMITTED: June 23, 1960

Card 8/9

ACCESSION NR: AP4023736 S/0114/64/000/003/0033/0035

AUTHOR: Zaryankin, A. Ye. (Candidate of technical sciences); Zatsepin, M. F. (Candidate of technical sciences)

TITLE: Effect of the housing-rotor gap upon the stage efficiency in a radial-axial turbine

SOURCE: Energomashinostroyeniye, no. 3, 1964, 33-35

TOPIC TAGS: turbomachine, radial axial turbine, turbine efficiency, turbine gap, radial axial turbine efficiency

ABSTRACT: New formulas for determining the effect of the gap on the efficiency are developed. This general formula gives a ratio of the efficiency with a gap Δ to the efficiency with 0 gap:

$$\frac{\eta_{0l}^{\Delta}}{\eta_{0l}^{0}} = \frac{\eta_{0l}^{\bar{\Delta}}}{\eta_{0l}^{0}} + \frac{\left(1 - \frac{\eta_{0l}^{\bar{\Delta}}}{\eta_{0l}^{0}}\right)^2}{1 - \frac{\eta_{0l}^{\bar{\Delta}}}{\eta_{0l}^{0}} + Q\left(\frac{\bar{\Delta}_1}{1+\bar{\Delta}_1}\right)^2 + k_1\bar{\Delta}_2\left(1+\frac{1}{\theta}\right)},$$

Card 1/2

ACCESSION NR: AP4023736

where Δ_1 and Δ_2 are the inlet and outlet gaps, respectively; $k_2 = \sin\alpha_{2\,out} / \sin\alpha_{2\,av}$ (where α_2 is the outlet-stream angle); $\theta = D_{av}/l_2$ (where D_{av} is the rotor-outlet average diameter, l_2 is the blade height at the outlet). Practical simplifications of the above general formula are indicated, and their good agreement with experimental data is reported. Orig. art. has: 6 figures and 15 formulas.

ASSOCIATION: none

SUBMITTED: 00 DATE ACQ: 15Apr64 ENCL: 00

SUB CODE: PR, AP NO REF SOV: 003 OTHER: 001

Card 2/2

S/096/60/000/011/017/018
E073/E135

AUTHORS: Deych, M.Ye., Sherstyuk, A.N., Zaryankin, A.Ye., Zatsepin, M.F., and Frolov, L.B.

TITLE: Investigation of Low Power Radial Turbines

PERIODICAL: Teploenergetika, 1960, No. 11, p 94

TEXT: This is an annotation of a recent research report by MEI. The technique of calculation of radial turbines is considered, giving experimental results on determining the influence of the nozzle system, the outflow angle of the flow α_1 and of the twist of the runner wheel, on the economics of the turbine. An electronic r.p.m. gauge is described. A method is presented of plotting profiles of nozzle systems of radial turbines, their geometrical dimensions and their experimental characteristics, and also data on investigating five runner wheels of various types. A maximum stage efficiency of $\eta_{oi} = 0.32$ was obtained. Theoretical considerations are given on calculating the end losses in nozzle lattices with a flow from the centre and towards the centre, and also certain calculations on determining the optimum chord of turbine profiles calculated for subsonic and supersonic flow speeds. There are no figures, tables or references.

Card 1/1

DEYCH, M.Ye., doktor tekhn.nauk; ZARYANKIN, A.Ye., kand.tekhn.nauk; FILIPPOV, G.A., inzh.; ZATSEPIN, M.F., inzh.

Method of raising the efficiency of turbine stages equipped with short blades. Teploenergetika 7 no.2:18-24 F '60. (MIRA 13:5)

1. Moskovskiy energeticheskiy institut.
(Turbines)

ZARYANKIN, A.Ye., kand.tekhn.nauk; ZATSEPIN, M.F., inzh.

Concerning the effect of losses in the rotor wheel on the efficiency of a Francis-type turbine. Izv.vys.ucheb.zav.; energ. 5 no.4:79-84 Ap '62. (MIRA 15:5)

1. Moskovskiy ordena Lenina energeticheskiy institut.
(Turbines)

81811

26.1000
10.3000

S/096/60/000/08/011/024
E194/E484

AUTHORS: Deych, M.Ye., Doctor of Technical Sciences, Zaryankin, A.Ye., Candidate of Technical Sciences, Filippov, G.A. and Zatsepin, M.F., Engineers

TITLE: Increasing the Efficiency of Short Turbine Runner Blades

PERIODICAL: Teploenergetika, 1960, Nr 8, pp 51-56 (USSR)

ABSTRACT: Work published in Teploenergetika, 1956, Nr 6, and by Nippert in Germany in 1929 has shown that if the angle through which a flow turns in a channel is great and the static pressures at inlet and outlet are not very different, the losses due to secondary flow in curved ducts and in short blades are not minimum when the flow is steadily constricted. Nippert showed that when the flow is turned through a large angle, the use of expansion followed by constriction of the ducts between the blades greatly reduces the terminal losses. The theoretical problem is very complicated and it is best to determine the optimum velocity distribution by experiments. Tests were made on the Moscow Power Institute blading for subsonic speeds details of which are given in Table 1. These profiles are intended for

Card 1/6

Increasing the Efficiency of Short Turbine Runner Blades

short blades and were obtained by cutting back the concave surfaces in such a way that the channel between the blades first expands then contracts. The convex surface of the blade is left unaltered. Typical duct dimensions for blades shapes TR2A and TR-2Ak are shown in Fig 1. In the new blades the inlet section is greater than the outlet section and the maximum section at the middle of the blades is greater than the inlet section. With blades of this type, the variations in channel section are, of course, affected by the pitch and angle of installation of the blading. Tests were made with blades of various heights and various ratios of maximum inlet and discharge widths. The range of variation of the main geometrical characteristics for blades of group Ak are shown in Table 2. The tests were made in the wind tunnel of the Moscow Power Institute with nozzles ranging from 20 to 50 mm high. The advantages of an expanding and constricting channel for short blades was confirmed by experiment. Pressure diagrams for channels of

Card 2/6

81811

S/096/60/000/08/011/024
E194/E484

Increasing the Efficiency of Short Turbine Runner Blades

different shapes with blade type TR-2A are shown in Fig 1. The results are discussed and it is concluded that there are three causes of the reduced terminal losses in blades with expanding and constricting channels, namely: the direction of the flow is altered at the lower mean speed; at the outlet section where secondary flows are intensified, the channel is constricted so that longitudinal pressure gradients are increased; in cross-section the length of the expanding section of the channel on the back of the blade is reduced as the point of minimum pressure is displaced in the direction of the flow. As will be seen from Fig 2, absolute values of loss factors in blades with channels of this type are reduced and, moreover, the distribution of losses over the height and pitch is more uniform. Graphs showing the relationship between the loss factor of the blading, the height and the angle of inlet are shown in Fig 3 for various kinds of blade. Curves showing the relationship between the loss factor, the ratio of the maximum to the inlet section and the

Card 3/6

4

S/096/60/000/08/011/024
E194/E484

Increasing the Efficiency of Short Turbine Runner Blades

height are shown in Fig 4; curves of the relationship between the loss factor, the pitch and the ratio of the maximum to the inlet section are shown in Fig 5. Optimum geometrical parameters for blades of group Ak are given in Table 3. It will be seen from Fig 5 and Table 3 that small variations in the ratio of the maximum to the inlet section do not appreciably affect the losses, the comparatively marked increase in losses at low relative pitch occurs because the channel is of less suitable shape. The influence of flow conditions on the efficiency of class Ak blading may be assessed from the graphs of Fig 6 and Fig 7. Fig 6 shows the influence of inlet angle; it will be seen that although the inlet losses do not vary much with inlet angle ranging from 25 to 35° the losses are less with blades Ak than with blades A. The influence of compressibility and Reynolds number on losses in the two types of blading is shown in Fig 7 and it is shown that compressibility does not have an appreciable

Card 4/6

81811
S/096/60/000/08/011/024
E194/E484

Increasing the Efficiency of Short Turbine Runner Blades

influence on the losses up to Mach 1. Tests made with blades B and Bk are shown in Fig 7b and it will be seen that at slightly supersonic speeds the presence of an expanding section beyond the inlet has a favourable effect on the losses. It is concluded that in blades where the flow is turned through large angles, the terminal losses may be appreciably reduced by using blades group Ak and Bk with expanding and constricting channels. The simplest way of making these blades is to cut back the concave surfaces of blades A and B which are widely used in turbines. The best amount of expansion of the inlet section depends mainly on the angle through which the flow is turned and the relative height of the blading. Blading of the type described should be used with relative heights less than 2 to 3 and when the flow is turned through angles greater than 120 to 125°. The use of these blades together with guide vanes type Am (having asymmetrical meridional profile) gives appreciable increase in stage

Card 5/6

4

81811
S/096/60/000/08/011/024
E194/E484

Increasing the Efficiency of Short Turbine Runner Blades

efficiency of short blades. There are 7 figures, 3 tables and 7 references, 6 of which are Soviet and 1 German.

ASSOCIATION: Moskovskiy energeticheskiy institut (Moscow Power Institute)

Card 6/6

4

ZARYANKIN, A.Ye., kand.tekhn.nauk; SHERSTYUK, A.N., kand.tekhn.nauk;
ZATSEPIN, M.F., inzh.

Experimental characteristics of Francis-type turbines.
Teploenergetika 8 no.6:37-41 Je '61. (MIRA 14:10)

1. Moskovskiy energeticheskiy institut.
(Turbines--Testing)

ZARYANKIN, A.Ye., kand.tekhn.nauk; SHERSTYUK, A.N., kand.tekhn.nauk;
ZATSEPIN, M.F., inzh.

Some ways of improving the economy indices of combined radial-axial turbines. Teploenergetika 9 no.5:32-35 My '62.
(MIRA 15:4)

1. Moskovskiy energeticheskiy institut.
(Gas turbines)

ZARYANKIN, A.V., kand. tekhn. nauk, dotsent; KATSERIN, M.F., kand. tekhn. nauk

Results of the study of the operation of turbine exhaust ducts. Izv. vys. uchab. zav.; energ. 8 no.11:30-35 N '65. (MIRA 18:11)

1. Moskovskiy ordena Lenina energeticheskiy institut. Predstavlena kafedroy parovykh i gazovykh turbin.

ZATSEPIN, N.

V sovershenstve znat' boevuyu tekhniku. Moscow, Voennoe Izdatel'stvo Voennogo, Ministerstva Soyuza SSR, 1952, pp. 55; 20 x 13. (Military Sciences--field)

LXIII

ZATSEPIN, N.

"Operation of the Hygrometer in the Case of Negative Temperatures," Meteorol. i gidrologiya, No 1, 1954, pp 39-42

In the practice of the Yakutsk Aerometeorological Station the following "oddities" are noticed in the behavior of the hair hygrometer: 1. Two control hygrometers carried from a warm place to the outside at a temperature of -50° indicated instead of an increase a decrease of relative humidity; only after 7 days after placement in a box did they come to read normal humidity. 2. For temperatures lower than -20° the ribbon of an aircraft meteorograph records humidity constantly increasing in course of the entire time of delay, ascent, descent, and second delay; a similar abnormality is obtained in the winter in the behavior of the humidity pen in the radiosonde. (RZhGeol. No 5, 1954)

SO: Sum. No. 568, 6 Jul 55

ZATSEPIN, N.I.

Comparative evaluation of laboratory methods used in diagnosing chronic dysentery. (Author's abstract). Zhur.mikrobiol. epid. i immun. no. 24 Mr '53. (MLRA 6:6)
(Dysentery)

ZATSEPIN, N.I., starshiy nauchnyy sotrudnik; TYUTKINA, N.F., vrach (Moskva)

Prevention of dysentery. Med.sestra no.6:3-6 Je '55. (MLRA 8:7)
(DYSENTERY, prev. and control,
in Russia)

ZATSEPIN, N. I., STUPAKOVA, T. F.

"Etiological Role of Serological Coli Types O 111, 055, and 026 in Dispepsia" Proceedings of Inst. Epidem and Microbiol im. Gamaleya 1954-56.

Interinstitute Scientific Conference on Problems of Dysentery [The following are identifications of personnel associated with the Institute of Epidemiology and Microbiology imeni N. F. Gamaleya who attended the conference held in Molotov, 4-7 April 1956] Inst. Epidem and Microbiol im. Gamaleya AMN USSR.

SO: Sum 1186, 11 Jan 57.

SHATROV, I.I. (Moskva); ZATSEPIN, N.I. (Moskva)

Control of intestinal infections in the U.S.S.R. Med.sestra 15 no.7:3-7 Jl '56. (MLRA 9:10)
(INTESTINES--DISEASES)

ZATSEPIN, N.I.; STUPAKOVA, T.F.

Etiological role of some serological types of Escherichia coli (026,055, 0111) in dyspepsia. Zhur.mikrobiol.epid. i immun. 28 no.5: 44-49 My '57. (MIRA 10:7)

1. Iz Instituta epidemiologii i mikrobiologii imeni Gamalei AMN SSSR.
(GASTROINTESTINAL DISEASES, etiol. and pathogen.
E. coli in dyspepsi).
(ESCHERICHIA COLI
in etiol. of dyspepsia)

ZA SEPIN, N. I.

"On the problem of the role of b. coli in acute intestinal diseases of young children."

Report submitted at the 13th All-Union Congress of Hygienists, Epidem iologists and Infectionists, 1959

SEREBRYAKOV, V.A.; ZATSEPIN, N.I.

Pressing problems in the control of acute intestinal diseases in the Tajik S.S.R. Zdrav.Tadzh. 6 no.1:14-19 Ja-F '59. (MIRA 12:10)

1. Zam.ministra zdravookhraneniya Tadzhikskoy SSR (for Serebryakov).
2. Zamestitel' direktora Stalinabadskogo instituta epidemiologii i gigiyeny (for Zatsepin).
(TAJIKISTAN--INTESTINES--DISEASES)

ZATSEPIN, N.I.

Conference of the Stalinabad Institute of Epidemiology and Hygiene. Zdrav.Tadzh. 6 no.3:43-44 My-Je '59. (MIRA 12:11)
(TAJIKISTAN--EPIDEMIOLOGY)